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BRAHMAN (ZEBU)
CATTLE



THERE are several types and breeds of Brahman (Zebu) cattle, all of which have their origin in some part of India. Certain areas have adopted a definite type, depending largely on the use made of the cattle—whether for meat, milk, or work.

The larger types have been imported into the United States and they have shown marked adaptability to certain sections of the Southwest and of the Gulf coast region.

Their ability to graze on scant pasture, their resistance to hot weather, diseases, and pests, and their breeding efficiency are characteristics which make them particularly valuable in certain sections of the Gulf coast.

Brahman cattle are commonly called “Brahma” in the United States and “Zebu” in South America and Europe. The committee on terminology of the United States Department of Agriculture has adopted the term “Brahman” as the preferred name of the species *Bos indicus*, the humped cattle of India.

BRAHMAN (ZEBU) CATTLE.

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THE development of numerous herds of Brahman cattle in sections of the Gulf coast, particularly in Texas, has attracted much interest to these animals. While they lack many of the desirable characteristics found in the beef breeds commonly raised in the United States, Brahman cattle appear to have other qualities which make them worthy of consideration for certain regions. As shown later, they are especially adaptable for portions of the country having a hot climate, droughts, and where cattle pests are troublesome. Brahmans have been raised under conditions which have given them unusual resistance against such adverse surroundings. They are worthy of study and consideration, both from the standpoint of a distinct breed and as a factor in general cattle-breeding operations.

CATTLE PRODUCTION IN INDIA.

In practically all parts of India, the home of Brahman cattle, these animals constitute a very important part of agriculture. They are used generally for work as well as for dairying and beef production. Some religious sects refrain from killing cattle or using meat as food. Among other sects, however, beef is used without objection. Reports from English officials on duty in India at various times concur in the statement that, particularly in southern India, which is one of the principal cattle-raising districts of all India, there exist side by side two types of cattle known as the "Nadudana," or small cattle, and the "Doddadana," or large cattle.

The small cattle are compact in form, of wide variation in color, are used especially for milk and other agricultural purposes, and are owned by the poorer class of people. The large cattle are less numerous and are used more in carting than for farming purposes. They show more uniformity in size and color, and are generally owned by the large landowners, or "raiyaats." In addition there are professional breeders who maintain herds in the vicinity of hills and forests

and sell the offspring at 1 or 2 years of age to raiyats, who in turn usually give the young cattle good care and sell them at the fairs which are held in different communities of the various provinces. At such places thousands of head of cattle often change hands. The purchase of the small cattle by raiyats for breeding up by using the large-type bulls is also mentioned in the early records. There are recorded instances of heavy losses of cattle from droughts in various sections of India.

In some Provinces there are three distinct classes of bulls and each class is handled differently. The choice bulls of the large type of cattle are generally fed or allowed to graze until mature in forest pastures, making superior breeding bulls. Bulls of the second class are also of the large type. They are bought when young, reared in villages, and intended for work purposes after castration, but meanwhile are used as breeding bulls. The practice of using them for breeding detracts from their value as draft cattle. The third class, or small-type bulls, is not controlled, and as the village cattle are allowed to range together inbreeding occurs. In some instances villagers have purchased the large-type bulls cooperatively and good results have been obtained by mating them with small-type cows. The smaller breeds are not raised by American breeders and are found in the United States at present only in zoological gardens and menageries.

DESCRIPTION OF BRAHMAN CATTLE.

The humped cattle of India are of the species *Bos indicus*, a distinct species from the cattle common in the United States, which are of the species *Bos taurus*. Indian cattle are commonly called "Brahman" or "Brahma" by breeders in the United States and "Zebu" in South America and Europe. In the strict sense, the term "Brahman," derived from the name of the Hindu divinity Brahma, applies only to the white bulls, which alone are regarded as sacred.

Certain general characteristics are common to practically all breeds of the large Brahman cattle. Each breed, however, has special characteristics which enable it to be distinguished from others. Much crossbreeding occurs in their native country, but enough systematic breeding is practiced and a sufficient number of herds are kept intact to maintain purebreds of the most important breeds because of their special value as milk-producing, beef, or draft characteristics. There is no registry of Brahman cattle, however, and the term "purebred" as applied to them is merely descriptive, signifying that they conform to the accepted type of the particular breed. The use of Brahman cattle as work animals constitutes the most important purpose of production. Beef and draft animals are found in the same breed. Draft animals, however, usually possess more or less desirable beef conformation. As compared to the improved breeds in America, Brahman cattle may be termed "leggy" or "upstanding." Probably the most striking points of distinction between them and the breeds to which we are ordinarily accustomed are the hump on the shoulders, the large, pendulous dewlap, and the loose, pendulous skin in the region of the navel.

The color of the hair as represented by purebred specimens may be termed solid, that is, not spotted. Spots indicate crossbreeding

of more or less recent date. Occasionally purebred animals may not be of a uniform color over the entire body, but the change of color from one part of the body to another is not abrupt and the colors blend into each other gradually. The greatest number of breeds are white or various shades of gray. The switch of the tail is rarely white and there are usually dark markings about the ears, muzzle, and eyes. Black hoofs prevail. The hide varies in color from chocolate-brown to black. The skin inside the ear, though generally dark, is usually lighter than that on the body. In some breeds the tint is orange, varying from a light to a rich orange color.

In most breeds the head of the female is usually long and slender, but in mature males it is often short and carries great breadth across the forehead. The ears are usually large and more or less drooping and swing forward and backward as the animal walks. The horns of the different breeds are variable in shape and size and in the direction in which they leave the frontal bone.

The neck is of medium size, with loose skin at the throat that may be termed a continuation of the dewlap, which often extends backward between the forelegs. In many breeds, correlated with the dewlap, there is a superabundance of skin about the navel, usually termed the sheath, but which in reality is not the case. On the males of some breeds this pendulous skin is extensive, and in such instances it usually extends forward and joins the dewlap between the forelegs. In other breeds it is almost absent, even though the dewlap may be large or well developed.

The hump is directly above the shoulders and corresponds to the withers of a horse. It varies in size and shape in the different breeds and is much larger in males than in females. It reaches the largest size at maturity of the animal, provided good, thrifty condition accompanies maturity. The hump is usually symmetrical in shape and resembles a bean set on edge after the lower part has been cut away. In many cases the bean-shaped hump appears to be formed of two segments, with the depression in the rear portion corresponding to the hollow at the eye of the bean. Other humps appear to consist of one block of flesh set in a more nearly upright manner. In some individuals the hump is comparatively thin and has a tendency to fold over, and moves from side to side as the animal walks.

The body is more nearly cylindrical in shape, generally shorter, and rarely as large as in Hereford or Shorthorn cattle. As in all breeds, some individuals are flat-ribbed; few individuals of the many breeds of Brahman cattle show great breadth of body. The fleshing is very muscular and with few exceptions is smooth. Instances of paunchiness are very rare.

The hind quarters are generally drooping. In some individuals there is a tendency toward roughness, probably due to the coupling of the last lumbar vertebra with the sacrum, resulting in a rafterlike prominence just behind the loin. From this point to the tail head, which may be termed "shortness of rump," the distance is generally shorter in Brahman than in other cattle. The general shape of the hind quarter above the hock joint is nearly circular and bears a slight resemblance to that of a horse. When Brahman cattle are in good condition there is an abundance of muscle which may not extend so low toward the hock joint as in other cattle, but ordinarily shows more width through the round and equally as much thickness.

The tail in most breeds is long and slender, "whiplike," and is usually set high on the rump. Brahman cattle possess fine, dense bone.

There is a marked difference between the call of this species and that of American breeds of cattle. The bulls do not bellow, but roar, and the cows grunt rather than low.

PREFERRED TYPES IN INDIA.

Conditions in India demand wide variation in the uses of cattle. Certain types are considered specially adapted to particular purposes or kinds of work. The physical characteristics of certain parts of the land demand special qualifications of work animals, and the activities in which they are to be employed are of special importance in selection of type in that country. Following are the usual requirements of cattle in the Mysore district of southern India, outlined in accordance with their employment. Variations in requirements are made to suit conditions in other sections.

BREEDING BULL.

Good length; good height—48 to 50 inches; long, tapering head with narrow and prominent forehead; small, prominent, and bright eyes; small and erect ears; thin, fairly long and gracefully set horns with small difference between thickness at bases and end; strong and fairly long neck with small, well-shaped hump; thin and short dewlap; broad, full chest; well-formed and strong shoulders and hind quarters; strong and well-rounded ribs; level back and broad loin; narrow flanks; level croup, and abruptly falling croup being condemned; thin, short, whiplike tail reaching down to or very little below the hock joint; a sheath having little or no pendulous growth; legs of medium length and well proportioned, having strong and fairly thick bones and moving together in perfect rhythm and not turned sidewise or brushing against each other; short fetlocks and hard, small hoofs with equal halves with a very narrow cleft between; a long shank is considered a weakness; black skin, horns, muzzle, and hoofs; skin covered with short, soft hair (blue-gray and iron-gray colors are preferred); compact body free from all pendulous growth; animal should be sound in every way, symmetrical, of good temper and pure breed, and free from hereditary disease.

HEAVY DRAFT CATTLE.

Good height, length, and big frame; thick, short, and strong neck; broad chest and loins and a level back; well-rounded barrel, having strong, broad, and well-sprung ribs; short legs, good bone, and well-formed but massive shoulders and hind quarters.

FAST-TROTTING CATTLE.

Medium-sized but very compactly knit frame; long and comparatively thin neck and well-balanced head; more or less level back and broad joints; round, compact barrel; long, thick legs, small fetlocks; small hump, dewlap, and sheath; thin and tight skin; narrow flanks.

PACK CATTLE.

Bony, compact frame; strong chest and frame; level, strong back, and well-arched ribs; short, straight, and stout legs with short pasterns and well-developed shoulders and thighs.

BRAHMAN BREEDS PROMINENT IN TEXAS.

While all purebred and practically all high-grade Brahman cattle in Texas conform to the general description already given, the

points of breed differences are very evident upon comparison of animals of different breeds. In spite of the fact that the number of cows in the Borden importation, which is discussed later, was not large enough to permit extensive production of purebreds, four of the breeds represented in the importation have been developed by the use of the imported Nellore bulls and imported cows of the same breed. In developing the three other breeds very high grades and in some instances practically purebreds have resulted from breeding up by using bulls of the same breed for several crosses.

THE NELLORE BREED.

The Nellore breed of cattle derives its name from the districts in India in which the best specimens are produced. The districts are

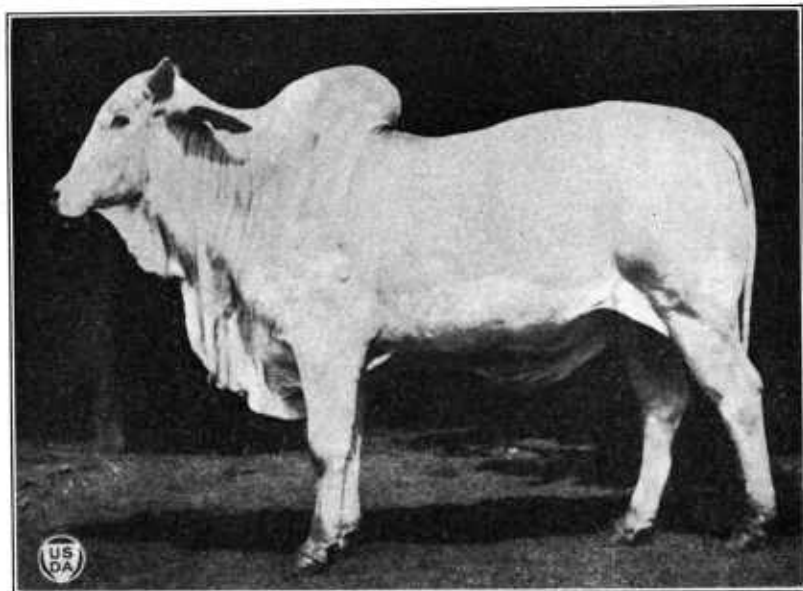


FIG. 1.—Purebred Nellore bull.

on the eastern coast of southern India in the Madras Presidency, and between 100 and 175 miles north of Madras. In areas where the best cattle are produced the range is an undulating highland interspersed with small hills. Sorghums, millets, and legumes are abundantly produced and are utilized extensively as feed for young stock. The well-to-do class of people take interest in the production of good cattle. In color Nellore cattle vary from steel gray to almost pure white (Fig. 1¹). Bulls may be of a steel-gray color over the entire body. A darker shade is permissible on the shoulders and hips.

The characteristics of the Nellore breed are: Moderately long face, fine muzzle, and broad forehead. The eyes are large, mild, and elliptical in shape and placed somewhat farther back on the head than in

¹ Illustrations in Figures 1, 3, 4, 5, 6, and 8, and on cover, were obtained by courtesy of Fernand Ruffier, São Paulo, Brazil. Cover illustration shows a Guzerat bull bred in India. Note the peculiar brands below the hump, which are characteristic in India.

most other cattle. The skin about the eyes, for $\frac{1}{2}$ inch, is black. The horns of the bulls are short and thick, inclined outward and slightly backward. In cows the horns are longer and thinner than in bulls, but extend in about the same direction from the head. Ears are pointed and drooping. The neck is short and thick and the hump is well developed in both cows and bulls, larger, of course, in the latter. The body is of moderate length and depth. The hind quarters are well fleshed and droop slightly. The tail is long, fine, and tapering. The legs are fine and show an abundance of clean bone. The dewlap is rather large and loose, and in bulls the sheath is pendulous. Cows often have a fold of skin in the position of the sheath and in many individuals it extends along the belly in front of and behind the navel (Fig. 2). This breed is one of the largest.

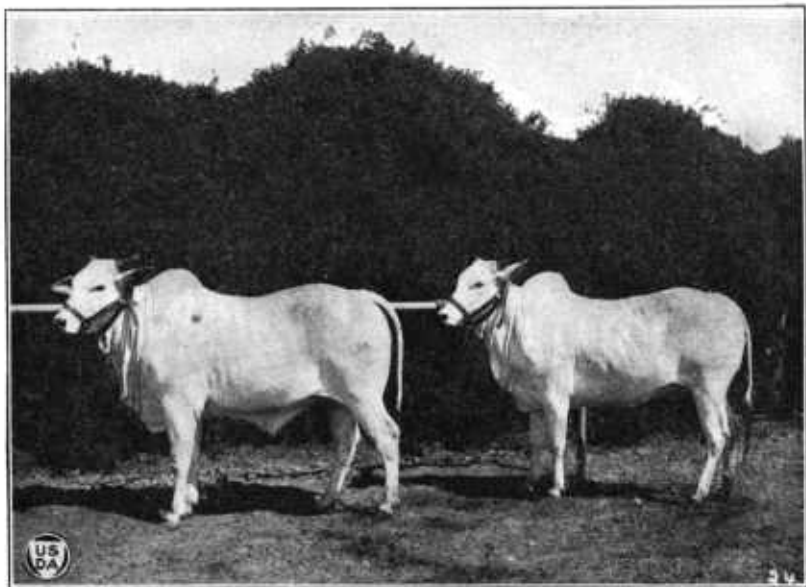


FIG. 2.—Nellore cows, fifteen-sixteenths full blood. The small development of the dewlap and of the loose, pendulous hide about the navel is one example of improvement in conformation that can be expected from proper mating. Note the smoothness of flesh.

THE GIR BREED.

Cattle of the Gir breed are produced most abundantly in the Gir Hills, which are situated in the southern part of the Kathiawar Peninsula, on the western coast of central India, 200 to 250 miles northwest of Bombay. The section in which the best of this breed of cattle are produced is characterized by luxuriant range, which is utilized for grazing all the year round. Much effort has been exerted to keep the breed pure. The herds are relatively small and do not run on a common range, but each owner keeps his cattle separated from the herds of others. This breed may be termed of medium size and is not so large as the Nellore. Though used extensively for milking purposes in its native country, it is not termed a strictly dairy breed, and its characteristics would not warrant such a classification.

An intimate mixture of two colors, or different shades of two colors, the one blending into the other, is very common in this breed. A usual combination is a medium shade of brown, blending with a dull red, which results in a color that may be termed a dull dappled-bay or dull brown. In some cases white is blended with brown in such a way as to produce a dirty white. In practically all instances the males are of darker shades than females.

The neck, ears, and legs may be much darker than other parts of the body. The cows have long and rather slender heads, with fine muzzles, but the bulls' heads appear to be much shorter, due to the greater width. The forehead of both sexes is prominent, that of the bulls especially so, due to the great convexity from the base of one horn to the base of the other. In the male the horns are thick at the base, curve backward abruptly, and then upward. In the cow the

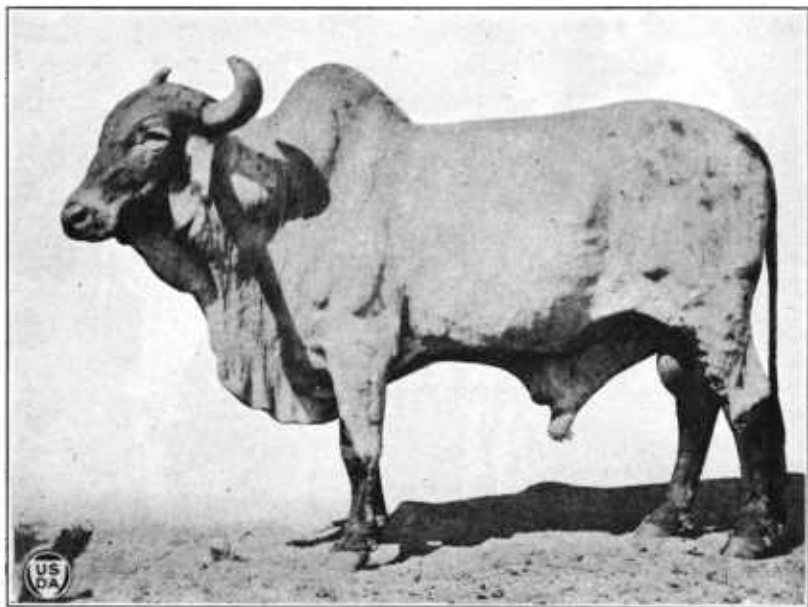


FIG. 3.—Purebred Gir bull.

horns are not so thick, are longer, and curve backward, often in a spiral, inward sweep. The eyes appear sleepy and are usually shaded by prominent, heavy eyebrows. The ears are long, resembling in general shape a longitudinal cross section of a bell. Calves' ears often reach beyond the nostrils. A nick near the point of the ear on the inside is very characteristic of the breed.

The hump is large in bulls and of medium size in cows. The shoulders and back are usually well fleshed. The body is square and fairly broad. A decided droop of the rump is rather common. The term "leggy" is applicable to the breed, but dense, clean bone is characteristic. In well-bred specimens the dewlap is large and the navels of cows and sheaths of bulls show an unusually large quantity of pendulous skin (Figs. 3 and 4). The Gir breed has a very desirable beef form.

THE GUZERAT BREED.

The Guzerat breed of cattle is produced largely in the central part of the western coast of India, about 200 miles north of Bombay. Several communities that are regarded as important in connection with the breed are Ahmadabad, Kaira, and Baroda. In addition to areas of exceptionally fertile valley lands that are cultivated intensely for crops, there are areas of well-watered, fine grazing lands that are considered excellent breeding grounds. Lying to the west of this section is a swampy area of range known as the Rann of Cutch. This area produces coarse vegetation that is grazed liberally by cattle. Guzerat cattle are used extensively for cultivation and cart work. Crossing with other breeds that have been brought in from other provinces has occurred to so great an extent that

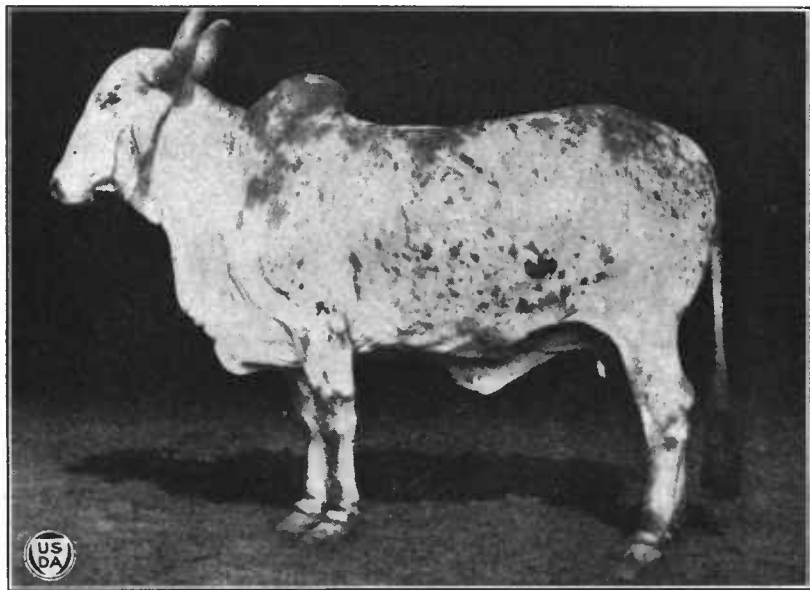


FIG. 4.—Purebred Gir cow.

there is a smaller number of purebreds than of animals carrying part Guzerat blood. The Guzerat type, however, prevails in most of the cattle in that province and is considered among the most desirable breeds of all India. The cows are not heavy milkers, and aside from work purposes the breed is classed, in its native country, as a beef breed. The average size is greater than that of either the Gir or the Nellore breed.

In color, white, silver gray, iron gray, and dark gray are permissible. The head, neck, and eyes are usually of a darker shade than other portions of the body. Dark hips and shoulders predominate in bulls. The skin inside the ear is usually of a rich yellow color. The head is long and slightly bulged above the eyes. A projecting vertical ridge on the frontal bone midway between the horns is not uncommon and varies in prominence among individuals. The eyes are mild. The ears are open as compared with those of the Gir and

are not so broad, long, or pendulous, but tend to stand out open and horizontally from the head. The horns rise from the head almost vertically, except that there is first an outward and then an inward bend (Figs. 5 and 6).

It is very characteristic of the breed that the hide, covered with hair, extends from 1 to 1½ inches along the base of the horns of both bulls and cows. The neck is fine and blends smoothly into a well-fleshed shoulder. The hump is large in bulls but not highly developed in cows. The ribs are well sprung and evenly fleshed and the depth of the body compares very favorably with the width. The rump is not so drooping as in other breeds, and the hind quarters show an abundance of thick muscle, which extends farther down the legs than is common in other Brahman breeds. Thrifty animals

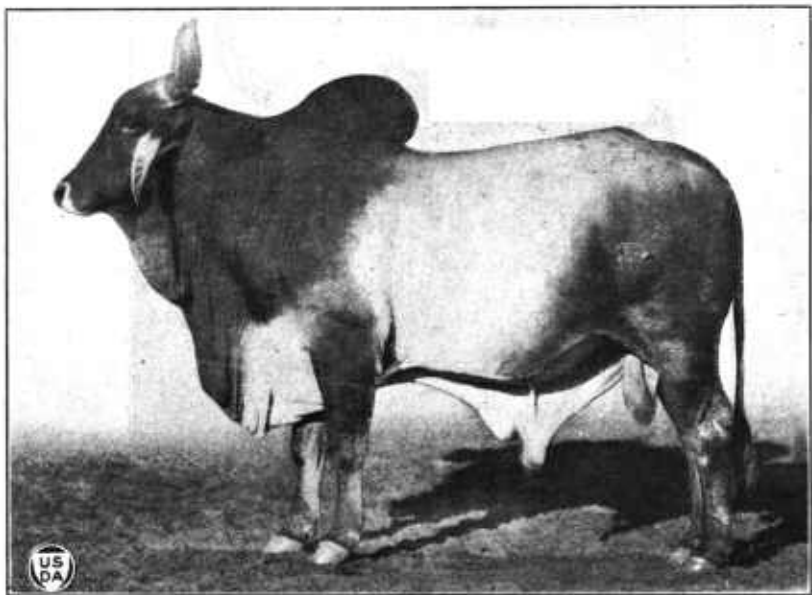


FIG. 5.—Purebred Guzerat bull.

show an abundance of natural flesh. The bone is clean, dense, and is larger than is ordinarily seen in other breeds. The dewlap and loose skin beneath the belly are well developed, but neither is so prominent as in the Nellore or the Gir breed.

THE KRISHNA VALLEY BREED.

The Krishna Valley breed is found in a section that lies in the western part of southern India, varying from 50 to 100 miles from the Arabian Sea coast and extending from approximately 100 to 250 miles southeast of Bombay. The best specimens of the breed are found along the valley of the Krishna River and its tributaries. There is little doubt that the breed resulted from the judicious crossing of Nellore, Guzerat, and native cattle of the Sangli State. Variations in type occur in this breed, owing probably to lack of proper

mating or systematic breeding. Choice individuals are large and are used extensively for oxen in their native country. They are especially adapted for slow, heavy work. (Fig. 7.) The cows are poor milkers.

There is color variation in this breed, but the more desirable individuals are white or light gray. The head is wide and massive, particularly in bulls. The frontal bone is broad and prominent. The muzzle is large. The eyes are placed somewhat on the sides of the head, as in the Nellore breed, and appear placid. The ears are about the same size and shape as the Guzerat, are of a rich orange color

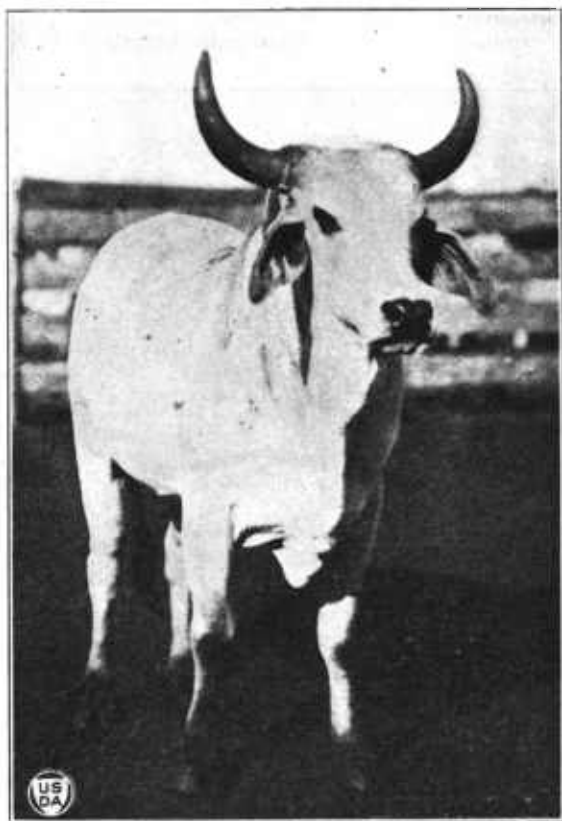


FIG. 6.—Purebred Guzerat cow.

inside, and have a tendency to droop. The horns are usually rather short, thick at the base, slightly flattened throughout the entire length, and spring from the head more or less horizontally with a gentle upward curve. The neck is comparatively short, thick, and deep and is made to appear particularly so by the unusual development of loose, wrinkled skin extending from the jaw along the side of the neck. The shoulders are compact and muscular. The hump is large. The body is wide and deep. More "scale" and more desirable top and bottom lines are shown in this than in any other breed described. The hind quarters are long, fairly level, deep, and fleshy.

The legs are usually straight and well fleshed. The bone is large and flat. The shank is shorter with regard to the length of the leg than in other breeds. The dewlap is well developed and is connected to a large, pendulous sheath by loose skin extending back between the forelegs. In size and conformation the best individuals of this breed probably compare more favorably with the American range type than any of the other three breeds described.

IMPORTATIONS AND DISTRIBUTION.

From available information the first importation of Brahman cattle appears to have been made in 1849 by Dr. J. B. Davis, of South Carolina, and consisted of a bull and two cows of the Mysore breed. In 1854 Richard Peters, of Atlanta, bought the herd of Doctor Davis and in time sold the offspring in various sections in the Southern

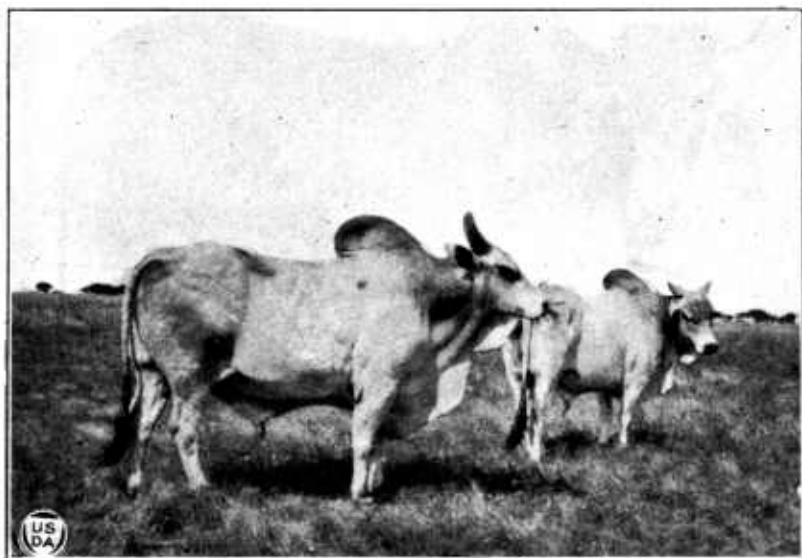


FIG. 7.—Grade Krishna Valley bulls.

States. About 1861 Mr. Barrow, of Louisiana, received five head of Brahman cattle from an Englishman who had observed the use of oxen on the Barrow farm and who had expressed a belief in improvement of native oxen by the introduction of Brahman blood. About 1866 some of the Barrow cattle were bought by Mr. Shannon and taken to his ranch near Galveston, Tex., and were purchased later by J. A. McFadden, of Victoria, Tex.

A Mr. Miller was moving to Texas in the sixties and was bringing cattle with him. A night was spent at or near the Barrow farm and one of Miller's cows was accidentally served by a Brahman bull. The result was a bull calf. Later Mr. Kennedy, of Corpus Christi, Tex., bought from Mr. Miller about 300 head of cattle showing Brahman blood. In 1875 Mr. Kennedy unloaded from a boat at Corpus Christi about 20 head of Brahman cattle that he had bought in the vicinity of New Orleans. The animals in this shipment died during the first

two years in Texas, but sufficient offspring resulted from services on native cows to permit retention of the blood.

In 1882 J. B. Frost, of Houston, Tex., and Albert Montgomery, of New Orleans, purchased two imported bulls. One of these bulls was bred to a cow of the Barrow herd and the offspring was a heifer calf. Upon maturity the heifer was bred to the other Frost-Montgomery bull. From this beginning Mr. Frost built up a small herd of Brahman cattle and later sold to Montgomery 15 choice heifers. W. B. Montgomery, of Mississippi, acquired ownership of the herd upon the death of Albert Montgomery and sold the cattle to A. M. McFadden and Tobe Woods, of Victoria, Tex. Mr. McFadden purchased Mr. Woods's interest and later sold the entire herd to his

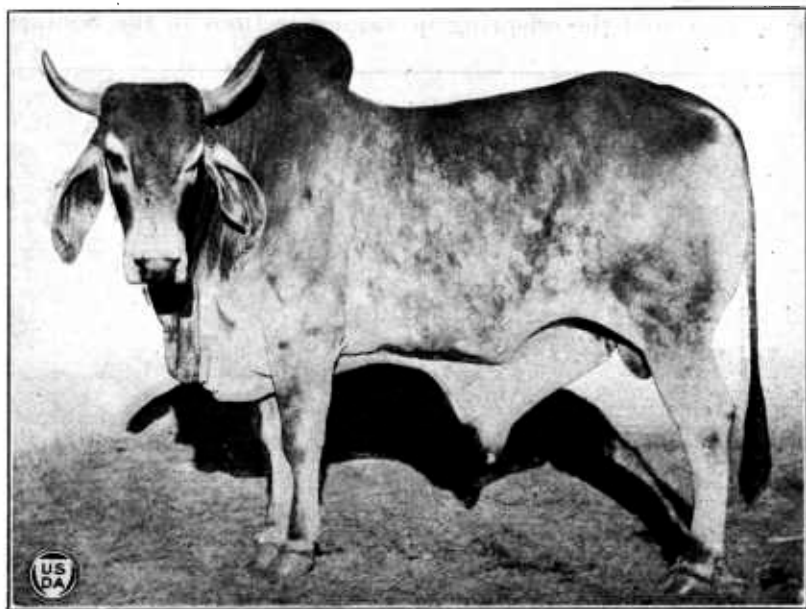


FIG. 8.—Crossbred Guzerat-Gir bull.

father, J. A. McFadden, under the agreement of the refusal on resale. The son later purchased the cattle.

From this foundation stock grade Brahman cattle became widespread throughout the Mexican Gulf coast region and preference was shown them in the early days in selecting range bulls, which usually meant little other than failure to castrate a desirable number of promising range calves to replace the bulls that died off the range or became too old for service. There is little doubt that the better class of range cattle in the coast region of Texas in particular in the early days carried a small percentage of Brahman blood. At any rate, until recently there was a class of hardier cattle of much larger size and of more desirable quality and type than the native cattle of Mexican origin found on the southwestern Texas ranges.

In 1906 A. M. McFadden purchased a bull and cow at St. Louis, Mo., from Hagenbeck's circus. Mr. Hagenbeck had imported the

animals in 1905. The cow died without raising a calf and the bull was used in the original McFadden grade herd.

THE BORDEN IMPORTATION.

The largest importation of Brahman cattle that has ever come into the United States was made in 1906 by A. P. Borden, executor of the Pierce estate, at Pierce, Wharton County, Tex. Contrary to the prevailing opinion that but one breed is represented by the Brahman

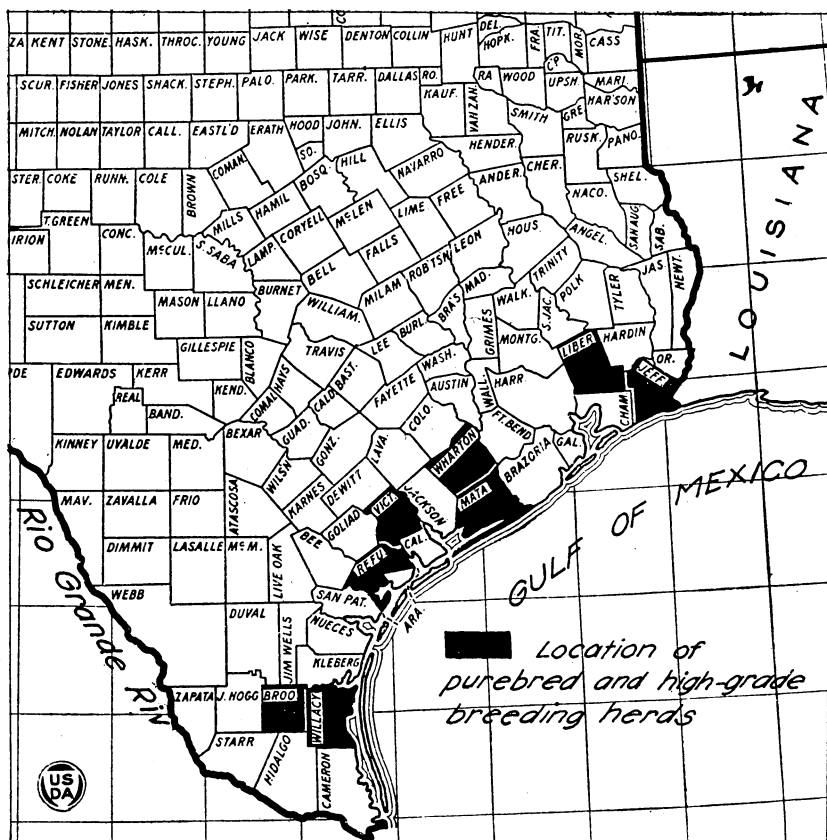


FIG. 9.—Portion of Texas in which Brahman cattle are principally distributed. Grade bulls for range purposes have been introduced into other sections of Texas. Brahman cattle are not raised commercially in other States.

cattle in Texas, the Borden importation, which consisted of 51 head, comprising 46 bulls, 2 cows, 1 heifer, and 2 calves, represented the Nellore, Guzerat, Gir, and Krishna Valley breeds, and others of minor importance. While in quarantine 18 of the cattle were destroyed and the remaining 33 were shipped to Texas. Tom O'Connor, of Victoria, Tex., received 16 of them and the remaining 17 were retained by the Pierce estate. Sale of offspring from the Pierce herd and sale of the O'Connor herd in addition to its offspring have resulted in a wide distribution of Brahman cattle in the Southern and

Gulf Coast States. In addition, introduction into southern New Mexico, central, western, and southwestern Texas, and exportations of bulls have been made to Cuba, Porto Rico, Colombia, and Mexico, respectively. There are at present, however, less than 100 head of purebred Brahman cattle in the United States, except those in zoological gardens and menageries, which are usually undersized and of such inferior type that their value for breeding is questionable.

TYPES OF RANGE IN TEXAS ON WHICH BRAHMAN CATTLE ARE PRODUCED.

The section of Texas in which the greatest number of Brahman cattle are being produced is a strip along the coast from the Louisiana line to the Rio Grande and varies in width from two to four counties, or from 50 to 100 miles. A small part only of this section is more than 300 feet above the sea level. The higher elevations are farther from the coast and the greater portion of this area is below the 100-foot contour. The rainfall varies from about 25 inches at the Rio Grande River to 50 inches at the Louisiana line and most of it falls in winter and early spring. All land is privately owned and cattle are produced almost entirely under pasture conditions.

The type of range near the coast varies from the flat, level, treeless prairies to the timbered creek and river bottoms. The predominant pasturage on the prairie ranges is salt grass (*Distichlis spicata*). Only a few of the many other plants have much value for grazing. Practically all native vegetation is coarse in texture and comparatively low in feed value. During the rainy season it is not uncommon for water to stand from 1 to 6 inches deep on the flat areas for several weeks at a time, due to the lack of drainage. Along the immediate coast wire grass (*Aristida* sp.) is generally the predominating type of range vegetation and is used largely for wintering purposes. If burned during the summer or fall the new growth comes out and can be utilized by cattle. Many of the larger operators own or lease wire-grass pasture for wintering purposes and utilize range from 15 to 40 miles inland during the other seasons.

In the creek and river bottoms there is a variety of grasses, weeds, and browse plants. This type of range is of special value for wintering purposes, owing to the protection afforded from cold north winds and the value of browse plants for grazing. Switch cane (*Panicum virgatum*) is more or less abundant and is very desirable for wintering mature cattle. Overflows are common in the spring, a condition which detracts from the value of the pastures for other than winter grazing.

In the northern third of the coast range and farthest from the coast, Piney Woods range predominates. The native grasses are comparatively low in feed value and can not be used extensively for wintering purposes unless other feed is supplied. Creek and river bottoms which occur with more or less regularity are used extensively for winter grazing.

In the southern half of the coast-range section the flat prairie areas are more limited than in the northern half. Near the coast occurs a sand-hill range which is rather rolling in nature, drains well, and supports a variety of grasses in addition to browse plants.

In the western counties and those near the Rio Grande the range varies from that supporting a heavy growth of shrubs and brush to the more open areas where mesquite brush (*Prosopis glandulosa*) is the principal shrub. Mesquite grass (*Hilaria sp.*) is the most important native forage plant. Owing to the fact that the rainfall decreases from the east to the west, the vegetation is not of rank growth and bears a closer resemblance to the semiarid regions of the far Western States. Droughts of several months' duration are not unusual in that section. The winter season is short and usually mild. Browse plants, important among them being the prickly pear (*Opuntia sp.*), furnish most of the winter feed. Dry, hot summers and seasons of scant range are the rule rather than the exception. In all portions of that section seasons of drought generally result in a lower percentage of calves than those of normal rainfall. The entire area, however, is considered a good breeding ground.

ESTABLISHED HERDS AND MANAGEMENT.

In practically every instance those who are producing Brahman cattle for breeding purposes maintain, in addition to the breeding herd, from which bulls for breeding purposes are sold, herds that are considered stock cattle; that is, cattle whose offspring are sold as commercial beef. Very few females of three-eighths or more Brahman blood have been sold, but have been retained for purposes of breeding up. Many five-eighths and three-quarter bulls have been retained, also, to breed up the lower grades. In most cases the breeder's own need for choice, high-grade bulls to use in breeding up or enlarging production has made it unwise to offer them for sale. It happens frequently that buyers of range bulls have not been able to purchase higher grades than those resulting from cows of three-eighths and bulls of from five-eighths to three-fourths Brahman blood.

Under the conditions described there have been established in Texas about 10 herds of breeding cows, each consisting of 500 or more breeding cows of five-eighths or more Brahman blood. Of these herds not more than two contain 1,000 head or more of breeding cows of the grade mentioned. A number of small, high-grade herds of 100 cows or less have been established during the last few years by using high-grade bulls for several crosses, in many instances beginning with three-eighths or lower grade cows. Bulls of the Borden importation were bred to native grade Shorthorn and grade Hereford cows, as these breeds were present in greatest numbers when the imported bulls were put to service. At first little effort was made to keep the various Brahman breeds distinct by using bulls of the same breed in the second, third, and subsequent crosses, as was used in obtaining the first cross. Efforts were made, rather, to obtain the greatest amount of Brahman blood, regardless of the breed, in the process of breeding up and crossing. The opportunity of observing and studying the various crosses has been afforded, and within the last few years some efforts have been and are at present being made to develop certain breeds to as high a degree of purity as possible by selecting grade cows of a certain breed and using the highest-grade bulls, of the same breed, that can be produced.

Formerly the matter of conformation received little attention, but in connection with breeding up of the respective breeds some breeders have begun systematic improvement of type. The most common criticisms that have been made of Brahman cattle are: Lack of width of body; uneven top line, with special emphasis on shortness and droop of rump; legginess or upstanding; excess development of dewlap and sheath; wild disposition; and irregularity of color. These criticisms have been duly considered by breeders, and selections to improve these and other qualities have been made. Several breeders are giving the top line and drooping rump serious study and are mating animals with less tendency toward those weaknesses. Others are breeding away from the highly developed dewlap and sheath. Practically all breeders who are giving attention to improvement are exercising care to avoid flat-ribbed individuals and attempting to add breadth to the body. A prominent breeder, in addition to improving conformation, castrates all young bulls that remain wild after attempts have been made to gentle them. Another discards for breeding purposes all individuals that will not fatten on the native range grasses. The fixation of color takes care of itself in the course of developing a certain breed.

In practically each instance the breeder has a plan of herd management to suit his own conditions. Certain matters, such as the selection of desirable cows to be bred to a bull of certain type or breeding and the allocation of separate pastures for the division of the herd, apply to all conditions. In some instances it is necessary to allot several bulls to a number of cows instead of dividing them into smaller groups, owing to the great expense for fencing and labor that would of necessity be incurred to segregate into smaller groups. Segregation made on the basis of the grade of cows is popular because of the fact that systematic improvement can be done at minimum expense by using the necessary number of bulls of proper grade. Further segregation of cows of approximately the same grade by color is practiced in several herds. To date no special advantage other than appearance of the herds has been derived from it.

Liberal winter feeding is not generally practiced. In practically all instances, however, choice animals are given better care than is accorded those of less value for breeding purposes, such as stock cattle, which are generally wintered on pasture with no additional feed. Some breeders are so situated that the breeding cows can be roughed through the winter in good condition. Bulls are usually removed from the cow herd during the winter season.

OBSERVATIONS OF BRAHMAN CROSSES.

Records are not available for an exhaustive study of the results that have been obtained from the various crosses of Brahman and the common breeds of cattle, owing to the facts that these cattle have been produced for commercial purposes and that data necessary for scientific study of inheritance have not been tabulated. Some very interesting and instructive facts have become indisputably evident, however, from crossing the two species. Some of these facts are responsible for the popularity that Brahman cattle hold among those engaged in the production of breeding stock or commercial beef cattle

by using grade Brahman bulls. The most prominent results from crossing are:

COLOR.

The half-breed obtained from crossing a purebred Brahman bull with a high-grade Hereford or Shorthorn cow is likely to be of such color marking as to show the influence of the dam. The grade offspring from Hereford cows will probably show white markings about the face and other parts of the body, but the markings do not necessarily correspond, so far as specific location upon the body is concerned, to the white markings of Herefords. A half-breed from a solid-red Shorthorn cow will probably be more or less a brindle, very often a dark brindle. A half-breed calved by a native cow is likely to be of any combination of colors common to cattle. Spotted individuals with dark colors prevailing are usual. By breeding a three-quarters or purebred Brahman bull to the female offspring of the first cross about 90 per cent of the second generation will conform to the general Brahman colors. In the third generation about 95 per cent will be of general Brahman colors. As the method employed in breeding up is to use high-grade bulls for several generations, the color problem solves itself.

COAT AND EARS.

In practically all grades, even to those carrying only from one-sixteenth to one-eighth Brahman blood, the short hair common to Brahman cattle is a dominant factor. In fact, the shortness and sleekness of the coat, in addition to the similar shape and slight droop of the ear, are means by which cattlemen recognize an animal of low Brahman grade. In one herd of cattle observed in making this study, Shorthorn bulls of practically pure breeding were bred to low-grade Brahman cows, about 1880, and Shorthorn bulls have since been used to produce the successive generations. Yet the cows at present maintained in the herd, though they correspond to Shorthorn requirements in every other respect, fail to do so in regard to coat, which is unmistakably Brahman, and ears, which are slightly larger, pointed, and stand out from the head at right angles. These two characteristics are typically Brahman.

RESISTANCE TO TICKS AND OTHER PARASITES.

The resistance to ticks by purebred Brahman cattle and of grades containing even a very small percentage of Brahman blood is largely responsible for their continued use and probably their ability to survive since early days in Texas. This peculiar resistance has been attributed to the shortness of the hair, thickness and toughness of the hide, and the waxy secretion from the hide. The opinion regarding thickness of hide seems to be unfounded, as is shown a little later. Observing cattlemen concur in the opinion that long-haired cattle harbor more ticks than cattle with short hair, on the grounds that greater protection is offered the tick by the longer hair.

In the opinion of J. D. Mitchell,² Victoria, Tex., the waxy secretion (though not of greasy nature or offensive odor) emanating from

² Mr. Mitchell was formerly employed by the Bureau of Entomology, United States Department of Agriculture, and availed himself of the opportunity of studying tick resistance of grade Brahman cattle before and after the Borden importation. Close observation was made of the O'Connor herd of imported Brahman cattle in addition to other official duties.

the hide forms a scum over the hide and extends to the ends of the hairs and is the principal reason for tick resistance. Mr. Mitchell observed resistance to tick infestation in grades of one sixty-fourth Brahman blood. This factor has been one of great interest to cattlemen on account of heavy losses of cattle that have occurred from Texas fever. Ticky pastures used for Brahman cattle become more or less free of ticks after two or three grazing seasons.

The following data relating to thickness of hide were compiled by Mr. Mitchell, and in each instance the hide in the flank, on the side, and dewlap was measured for thickness.

TABLE 1.—*Thickness of hide of Brahman and other breeds of cattle, in millimeters.¹*

Breed.	Number.		Average thickness of hide.
	Cows.	Bulls.	
Hereford.....	24	2	12.70
Aberdeen-Angus.....	10	1	10.40
Red Polled.....	17	4	10.30
Shorthorn.....	21	1	9.30
Brahman.....	1	23	8.83

¹ A millimeter equals about one twenty-fifth of an inch.

No authentic information is available regarding the toughness of the hide of Brahman cattle except in the following statement: "The hide, while it may be as thin as in our domestic animals, still appears to be much tougher and is more difficult to penetrate with a hypodermic needle."²

Few animals infested with lice have been found upon examination of Brahman cattle. They also show a noticeable lack of annoyance by mosquitoes and small black flies, so prevalent on the coast range at certain seasons of the year, which cause other cattle often to quit grazing, bunch, and begin to wander.

SIZE.

The average weight of mature cows in the coast section is about as follows: Natives, 650 to 700 pounds; grade Herefords, 800 to 850 pounds; grade Shorthorns, 850 to 900 pounds. Brahman cows of five-eighths or higher grade in good flesh average from 900 to 1,000 pounds, depending largely on the care that has been given them. Cows that have been well fed often weigh about 1,150 pounds. Three-fourths grade Brahman range bulls in good breeding condition weigh from 1,200 to 1,500 pounds, with some individuals above that weight. Mature cows resulting from the use of three-fourths or higher grade bulls on native grade Hereford or grade Shorthorn cows average around 1,200 pounds, varying from 1,000 to 1,400 pounds, depending largely on the quality of the dams. It has been consistently observed in grade Brahmans that the better the dams the better the offspring. When half-breed cows are bred

² Twenty-sixth Annual Report of the Bureau of Animal Industry, 1909, p. 84.

back to high-grade Brahman bulls, the size, as compared to the half-breeds, decreases. Three-eighths grades or thereabouts compare very favorably in size with half-breeds, particularly if sired by a good "growthy" bull. The lower grades, even to eighths and sixteenths, usually show considerably more size than cattle carrying no Brahman blood.

When born, Brahman calves are generally small as compared with those of other breeds, but they make very rapid growth. Grade Brahman calves at weaning time outweigh other range calves produced under the same conditions by from 50 to 75 pounds. A variation ranging from 15 to 20 per cent favoring the Brahman is found when comparisons of the weights of veal calves of from 3 to 5 months of age are made.

Comparisons of aged Brahman steers with other breeds can hardly be made; the best Brahman calves that are castrated (because they probably would not develop into desirable range bulls) are generally sold as veal calves. The small percentage that are matured as steers are therefore not representative of the average size and best quality of grade Brahman cattle.

CONFORMATION.

The general conformation of purebred Brahman cattle in comparison with that of the strictly beef breeds is somewhat angular and there is a lack in breadth of body. But examples of improvement in these respects warrant the statement that proper selection reduces undesirable features in general conformation to the minimum.

The hump practically disappears in cattle of not more than one-half Brahman blood, but increases in prominence as the percentage of Brahman blood increases, depending on the characteristic hump of the breed in question. Half-breeds and lower grades, as low as one-eighth, show less angularity on the whole than those of higher breeding, depending largely on the conformation of the individual's dam. The top line becomes straighter, breadth of body is increased, and the dewlap and sheath decrease in prominence. The characteristic fleshing of the Brahman, particularly in the shape, breadth, and thickness of the thigh, generally prevails in the lower grades.

TEMPERAMENT.

Brahman cattle of all grades are more alert and nervous than other breeds. When not handled regularly they are apt to become more or less wild, but when handled regularly and properly they become as docile as any breed. In working them on the range they bunch readily, and more labor is ordinarily employed in holding back rather than in driving a herd. Unnecessary noise, dogs, and whips should be avoided.

PROLIFICACY.

The prolificacy of Brahman cattle as compared to others under coast-range conditions is favorable to the former. The cows calve very regularly. A common ratio where Brahman range bulls are used is 1 bull to 60 to 75 cows. Equally as high a percentage of

calves is received from that ratio as when 1 range bull of other breeds is allotted to from 25 to 30 cows. Observing range men have noted that Brahman bulls herd their cows well and do not render excessive service when a cow is in heat.

HARDINESS.

In addition to being little affected by the heat, which is sometimes intense in southern Texas, the characteristic hardiness of the Brahman has had a great influence on the use and distribution of these cattle for range purposes, especially in southwestern Texas during recent years. Periodic droughts, if of sufficient duration, necessitate the shipment of range cattle to other ranges for grazing. During the extended drought of 1917, 1918, and 1919 an opportunity of comparing the various breeds of range cattle was afforded. A much lower percentage of Brahman than of other cattle were shipped out from the same ranges. In making this study the writer had occasion to observe approximately 75,000 head of range cattle of the various breeds mentioned and on the various types of range previously described. A drought of eight months' duration had prevailed over the greater part of the area at the time. Invariably in the same pastures dry Brahman cows were fat and cows suckling their calves were in good flesh. Dry cows of other breeds were generally in good flesh, but the suckling cows were poor and weak.

It is believed by many cattlemen of southwestern Texas that the best plan of utilizing the hardiness of Brahman cattle is to maintain the Brahman blood in the breeding cows to the extent of one-half or higher if desired and use good range bulls of other beef brands. The reasoning is that the range man can better afford to feed bulls during drought rather than to ship breeding cows to other ranges. The system seems to be feasible and worthy of investigation.

BREEDERS' ORGANIZATION DESIRABLE.

The two distinct phases of Brahman cattle production—that is, the maintenance of herds to produce high-grade or purebred breeding stock and the production of grade Brahman beef cattle—are interdependent. Among the immediate needs of the producers of breeding stock is an organization for the purpose of fixing a standard of excellence and a system for recording the animals that conform to the standard. Breed improvement is the factor that will greatly influence the future of Brahman cattle, and can be brought about best through an organization which should function to discourage the use of low-grade Brahman bulls for breeding purposes as well as further the distribution of a species whose good qualities merit perpetuation.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

October 6, 1923.

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